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NUTRIENT COMPOSITION OF GRILLED COOKED PANGASIUS MEAT AND THEIR ANALYSIS OF PROXIMATE, FATTY ACID AND MINERAL COMPOSITION

S. KOTHANDAPERUMAL

Department of Fish Processing Technology, Thoothukudi, Schools of Post- Harvest Technology

ABSTRACT

The proposed research is to analyse the nutritional composition of heat treatment Pangasius meats. Catfish lipids are low because of a small amount of n-3 family PUFA and a high amount of MUFA and SFA. The SFA and trans C18:1 MUFA can increase the risk of chronic cardiovascular diseases that affects the heart, blood vessels, and brain. Effective processing method can get rid of the fat content in Pangasius catfish fillet and provide a good protein food for consumers.

The present project is therefore proposed to develop a suitable preprocessing method for the removal of fat from catfish fillets. Domestic grill oven is used for heat treatment, to reduce the SFA and MUFA content of fish fillets. The present research is proposed to study the proximate composition, fatty acid composition and minerals composition of the raw and microwave defatted fillets.

KEYWORDS: Nutrient Composition of Grilled Cooked Pangasius Meat and their Analysis of Proximate, Fatty Acid And Mineral Composition

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Original Article

1. INTRODUCTION

Pangasius genus includes the catfish varieties that are commonly found in the south-east Asian region. It belongs to the family Pangasiidae. The most common variety of cultured fish is Pangasianodon hypophthalmus. This fish species is also called, Sutchi catfish, striped catfish, or Tra fish. Among all the freshwater species, Pangasius catfish is the world's fastest-growing species in aquaculture. They are traded worldwide as skinless and boneless fillets popularly along with portions, steaks, fillets, and also as value-added products Jeyakumari et al., 2016; Thi et al., 2013). The fish attains a bodyweight of 1.2 to 1.3 kg rapidly within six months but usually harvested after eight months of culture. There is a tremendous demand for fish-based products, especially value-added products such as ready-to-eat "convenience" products. The filleting industry produces significant amounts of head, bone, scrap meat, and skin by-products. By way of proper processing, it can be converted to various high-value products, and it has good economic efficiency. The utilization of Pangasius fish waste is an excellent potential source for value-added products.Studies on the development of Pasta products from Pangasius fish are detailed below. Pangasius fillets are a good substitute for white-fleshed fishes in the market due to their increasing acceptability and popularity; Pangasius is usually served in the European market as skinned and boneless frozen fillets (Noseda *et al.*, 2012), currently, these fillets exported to over 100 countries worldwide. Fillets were characterized by high moisture levels of 80% and low crude protein of 15.8% and lipid of 3.0% contents. Total lipids were characterized by low cholesterol levels of 40 mg/100 g, high percentages of saturated fatty acids (47.5%) of total fatty acid. Low percentages of polyunsaturated fatty acids (20%) are present in total fatty acids mainly represented by linoleic acid

(60% of total polyunsaturated fatty acids).

The mineral composition was characterized by a high sodium content of about 595 mg/100g (Domiszewski et al., 2011). The pasta is mainly prepared from wheat flour, which contains about 10–15 g/100 g of protein but there is a lack of essential amino acids, making it an incomplete protein. To compensate for the lack of protein in the pasta, fish protein can serve as an excellent source of proteins as they contain all the essential amino acids with excellent digestibility and it is efficiently available at low cost. Pangasius is a majorly cultured freshwater fish species in India; it is a rich source of proteins and other nutrients. Pangasius fillet contains a considerable amount of rich fatty acids and proteins. This work is mainly focused on the study of nutritional composition such as proximate, fatty acid and mineral composition (Mahmoud et al., 2012).

2. MATERIALS AND METHODS

2.1. Materials

Pangasius hypophthalmus were collected from Madurai AM fish farm and fish markets. The collected fishes were kept in insulated iceboxes. Insulated icebox prevents dehydration, and temperature fluctuation thus delays the spoilage of fish. Further, it is easy to handle. Flake ice produced by flake ice machine was used during fish transportation and for processing purpose.

Size of the ice for 2-3 cm level were produced to kept into the box and fish were spread on ice layer then carried out further steps.

2.2. Method

2.2.1. Sampling Procedure

Randomly samples were chosen and analyzed for proximate, fatty acid composition(PUFA) and mineral composition. Samples were collected from raw fillets and grilled cooked meat.

2.2.2. Proximate Composition Analysis

The protein, fat, ash, water and carbohydrate content were analyzed by AOAC methods (2000). 1 gram wet sample need for analysis of protein content, 4.5-5 gram of samples are used to estimate of the fat content, 2 gram of dry sample are used to estimate of the ash and 10 gram of wet samples are used to analysis of the moisture content. The protein content of raw fillet, cooked meat and pasta product was analyzed by the Kjeldahl method (1883). The digester temperature was followed at 300 to 400°C and distillation process was run for 8 minutes. The fat content of raw fillet, cooked meat and pasta product was analysed by Folch methods (1957). The moisture content of raw meat, cooked meat and pasta products were analysed by AOAC methods (2000). The samples were kept in hot air oven for 12 hours at 100°C. Ash content of raw meat, cooked meat and pasta products were analysed by AOAC methods (2000). The samples were kept in muffle furnace for 24 hours at 550°C. The carbohydrate content of raw meat, cooked meat and pasta products were analysed by different methods.

The protein estimated chemicals are inclusion of sulfuric acid, digestion mixture: copper sulfate-0.1g and potassium sulfate-2.5 g for each sample, sodium hydroxide, 40%, boric acid,4%, mixed indicator: methyl red-0.16g and bromocresol green-80 mg in 100ml of 95% ethanol and standard sulfuric acid 0.1N. analyzed fat composition was used chemicals inclusion of chloroform and methanol (2:1) and potassium chloride(KCL), 0.74%. and one more method of soxhlet used in 80 ml of petroleum ether. crude fiber analyzed chemical inclusion of sulfuric acid 1.25% and sodium

hydroxide 1.25% and petroleum ether 40-60℃.

2.2.3. Fatty Acid Aomposition Analysed by Gas Chromatography

Fatty acids are a very important component of lipids content. GC is the most common method used for analysis of fatty acid composition. The fatty acid is a complex structure. It contains more components of fatty acid such as acylglycerols, cholesterol esters, waxes and glycsosphingolipds. It is extracted b saponification hydrolysis it is done by alkaline medium AOAC,1990. The FAMEs are extracted by use of the methanol and boron trifluoride. Extraction and methylation is done by folch method are used to obtained the lipid components from the ten gram of fish samples. Esterification was done, take 250g lipid fraction it is dissolved into toluene in the round bottom flask. Then, added 4ml sodium hydroxide and reflux for 5-10minutes until droplets of fat disappear. added 5ml of methanol and reflux for another 1min. cool the content and add 15ml of saturated sodium chloride solution. then, add 5ml of hexane, shake well and then remove the upper layer hexane layer. Repeat the extraction with hexane twice. It combines hexane layer and evaporates to dryness in a rotary flask evaporator set at 55-60℃. The methyl esters in 1ml of HPLC grade hexane for injection in GC. The column at 210℃ for 30minutes. then, inject 0.5ml of standard FAMEs mixture onto the GC. Then, separation of FAMEs takes 45min.

Next, inject 0.5ml of sample FAMEs. Identify the individual fatty acid in the sample by comparing the retention time of the individual fatty acid in the standard mixture. calculated area unit value expressed to percentage of the fatty acid of total lipids.

2.2.4. Mineral Composition Analysis

Some vital macro and trace mineral content of raw meat, cooked meat, and pasta products was analysed by titrations methods. Titration methods were used to analyses samples. Ca, Mg, Fe, Zn, Na and P contents of raw and defatted meats. Ca, Mg and Zn were analysed by EDTA titration method. sodium done by flame photometer, phosphorous was done by amino naphthol sulphonic acid and iron was done by 1:10 phenanthrolene.

Calculation: (mg/100 g) =T. V× N× 100× D.F/W×0.05

2.3. Statistical Analysis

The SPPS 19 (IBM, 2O10) statistical package was used for the analysis of experimental results. The results were produced in the mean standard deviation.

3. RESULT AND DISCUSSIONS

3.1. Proximate Composition of Raw and Defatted Pangasius Fillets

Grill oven cooked methods of heat treatment used to remove the fat content of the fish fillets with minimal nutritional damage. The proximate composition of the raw, grill, methods were studied.

Those were estimated for the content of the moisture, protein, fat and ash, 72.12±0.68%, 21.52±0.60%, 4.32±071% and 1.31±0.065% and 69.94±1.014%, 24.52±0.48%, 4.93±0.266% and 1.43±0.225% and 70.93±2.571%, 23.85±0.911%, 3.87±1.036 and 1.31±0.052% and 66.54±0.373%, 25.88±0.802%, 7.06±0.332 and 1.53±0.141% was reported by Marimuthu et.al., 2011. This study was expressed after heat treatment and there was an increase in content of the protein, fat and ash and a decrease in moisture content which was reported by Erosy and Ozeren, 2009.

The present study the Pangasius fish fillets were used to remove the fat content, the fat content SFA and MUFA

could be reduced or removed by use of the different heat treatment method such as the microwave, grilled and steam method. The proximate composition of the grill cooked fillets of the head, body, ventral and tail portions was estimated as moisture, protein, fat, ash and carbohydrate from head portion-67.46%, 24.16%, 4.32%, 2.34% and 1.71%, body portion-67.54%, 24.23%, 4.44%, 2.22% and 1.56%, ventral region-67.15%, 24.22%, 4.63%, 2.05% and 1.93% and tail portion-67.02%, 24.15%, 3.56%, 2.05% and 2.34%. The proximate composition of the grilled cooked meat is found to be in the range of up to 98.65%. The fat, moisture, protein, ash and carbohydrate content could be increased or decreased is based on the portion of meat. ANOVA test was applied to analyze the sample variation between the samples. Degrees of freedom 2. T-test was applied there is no significant difference between samples and F-test was applied there was little significant variation between samples. F- test not that much variation between the samples. 0.1% means only one percent changes from100 percentages of samples.

Grilled Cooked Pangasius Head Portion

Table 1: Proximate Composition of Pangasius Fillets

Composition	Sample-1	Sample-2	Sample-3	Total/Average
Moisture	67.44%	67.47%	67.47%	67.46±0.000
Protein	24.18%	24.15%	24.15%	24.16±0.000%
Fat	4.31%	4.36%	4.31%	4.32±0.000%
Ash	2.36%	2.36%	2.31%	2.34±0.000%
carbohydrate	1.71%	1.66%	1.76%	1.71±0.000%

Grilled Cooked Pangasius Body Portion

Composition	Sample-1	Sample-2	Sample-3	Total/Average
Moisture	67.57%	67.53%	67.53%	67.54±0.000%
Protein	24.24%	24.21%	24.24%	24.23±0.001%
Fat	4.43%	4.45%	4.45%	4.44±0.000%
Ash	2.23%	2.23%	2.20%	2.22±0.000%
carbohydrate	1.53%	1.58%	1.58%	1.56±0.000%

Grilled Cooked Pangasius Ventral Portion

Composition	Sample-1	Sample-2	Sample-3	Total/Average
Moisture	67.12%	67.17%	67.17%	67.15±0.000%
Protein	24.23%	24.23%	24.21%	24.22±0.001%
Fat	4.65%	4.62%	4.62%	4.63±0.000%
Ash	2.06%	2.05%	2.06%	2.05±0.000%
carbohydrate	1.94%	1.93%	1.94%	1.93±0.000%

Grilled cooked Pangasius Tail Portion:

Composition	Sample-1	Sample-2	Sample-3	Total/Average
Moisture	67.02%	67.04%	67.02%	67.02±0.000%
Protein	24.14%	24.14%	24.18%	24.15±0.001%
Fat	4.21%	4.21%	4.23%	3.56±0.000%
Ash	2.23%	2.27%	2.27%	2.25±0.000%
carbohydrate	2.40%	2.34%	2.30%	2.34±0.000%

Grilled Sample-h	T-test	F-test
Moisture	0.000	0.1
Protein	0.000	0.2
Fat	0.000	0.6
Ash	0.000	0.0
CHO	0.000	0.0

Grilled Cooked Sample-b	T-test	F-test
Moisture	0.000	0.0
Protein	0.000	0.0
Fat	0.000	0.0
Ash	0.000	0.0
CHO	0.000	0.0

Grilled Cooked Sample-v	T-test	F-test
Moisture	0.000	0.1
Protein	0.000	0.5
Fat	0.000	0.0
Ash	0.000	0.0
CHO	0.000	0.0

Grilled Cooked Sample-t	T-test	F-test
Moisture	0.000	0.0
Protein	0.000	0.3
Fat	0.000	0.0
Ash	0.000	0.0
CHO	0.000	0.0

3.2. Fatty Acid Composition of the Pangasius Fillets

The fatty acid composition, as well as lipid quantities, can be affected by the use of heat treatment to change the fat content of the fillets by using different heat treatments such as the microwave, steam and boiling depending upon the size of the meat, heat surface area, nature of the fish species and the heat temperature and it was reported by Gall et al., 1983. The fat content, mainly SFA and MUFA, is affected by the microwave cooked method and it is established by Pikul and Wojciechowska, 1994, and Kolakowska and Bienkiewicz, 1999. It was reported that the heat treatment causes the increase or decrease of the fat content. The composition of the fatty acid such as the SFA, MUFA and PUFA in the raw, steam and microwave- 47.15%, 46.73% and 46.91% respectively. The heat treatment affected the fat content of the SFA and it was changed from 47.15% to 46.93%, in the case of treated samples, the reduction in the content of the saturated and mono-unsaturated fatty acid is increased or decreased to more than one percent after heat treatment. The MUFA content is constituted within the range of up to 40. 41% to 41.00%, in this result, the fatty acid composition changed by the treatment to up to 0.59% was reported. The PUFA content is increased after heat treatment and constituted the range of up to 12.45% to 12.53% respectively. in the present study, the defatted Pangasius fish fillets constituted more amount of saturated and mono-unsaturated fatty acid and it is reduced by the use of the different heat treatment such as the microwave, steam and grilled and present microwave cooking method it could be used to change or affect the SFA, MUFA and PUFA content of the fatty acid in the raw and the cooked meat. In the present research purpose, the removal of the saturated and mono un-saturated fatty acid can be used to cause heart disease and affect the market fetching rate.

The present research proposed to defattening of Pangasius fillets were used by under grill oven at maintaining the temperature 120℃ for 15 minutes. After heat treatment, the SFA and MUFA content was reduced and mineral composition was increased. The proximate composition was increasing the protein and ash while decreasing the moisture and fat content. Raw Pangasius meat contains head portion of saturated fatty acid-53.04%, mono-unsaturated fatty acid-40.7% and poly-unsaturated fatty acid-7.06%. Body portion of saturated fatty acid-51.77%, mono-unsaturated fatty acid-40.44% and poly-unsaturated fatty acid-7.06%. Ventral portion of saturated fatty acid-50.37%, mono-unsaturated fatty acid-40.47% and poly-unsaturated fatty acid-7.07%. Tail portion of saturated fatty acid-46.79%, mono-unsaturated fatty acid-39.83% and poly-unsaturated fatty acid-6.94%. Grilled heat treatment was used to reduce saturated and mono-unsaturated fatty acids and retention of poly-unsaturated fats after defatted meats

Table 2: Fatty Acid Composition of Pangasius Meat

Compounds	Fatty Acids	Head Portion	Body Portion	Ventral Portion	Tail Portion
C 4:0	Butyric acid	0.13	0.12	0.10	0.11
C 12:0	Lauric acid	0.14	0.11	0.13	0.15
C 14:0	Myristic acid	4.42	4.45	4.41	4.47
C 14:1	Myristoleic acid	0.06	0.04	0.07	0.05
C 15:0	Pentadecanoic acid	0.40	0.42	0.44	0.43
C 15:1	Cis-10 Pentadecanoic acid	0.24	0.21	0.23	0.26
C 16:0	Palmitic acid	29.45	29.56	29.34	29.83
C 16:1	Palmitoleic acid	1.61	1.63	1.60	1.65
C 17:0	Heptadecanoic acid	0.43	0.41	0.44	0.42
C 17:1	Cis-10 Heptadecanoic acid	0.14	0.16	0.13	0.15
C 18:0	Stearic acid	8.18	8.27	8.53	8.25
C 18:1t	Vaccenic acid	35.13	35.27	35.54	35.35
C 18:2t	Linolelaidic acid	5.17	5.24	5.43	5.27
C 18: 2 n6c	Linoleic acid	0.14	0.13	0.15	0.12
C 18:3n3	α-Linolenic acid	0.85	0.82	0.80	0.83
C 13:3 n6	ϒ-Linolenic acid	0.15	0.14	0.13	0.16
C 20:1	Cis-11 Eicosenoic acid	0.62	0.60	0.64	0.63
C 20:2	Eicosadienoic acid	0.54	0.52	0.50	0.54
C 20:4n6	Arachidonic acid	0.41	0.44	0.46	0.43
C 20:3	Dihomo-γ-linolenic acid	0.19	0.17	0.18	0.15
C 21:0	Henicosanoic acid	0.55	0.53	0.52	0.51
C 22:0	Behenic acid	1.31	1.35	1.33	1.32
C 22:1n9	Erucic acid	0.54	0.51	0.55	0.53
C 22:2	Docosadienoic acid	0.03	0.04	0.02	0.01
C 22:6n3	Docosahexanoic acid	0.24	0.26	0.28	0.23
C 23:0	Tricosanoic acid	0.1	0.3	0.5	0.2
C 24:0	Lignoceric acid	0.42	0.41	0.40	0.44
C 24:1	Nervonic acid	0.86	0.84	0.87	0.83
Unknown		**7.55**	**7.05**	**6.28**	**6.68**
Total		**100**	**100**	**100**	**100**

Samples	Grilled Head Portion	Grilled Body Portion	Grilled Ventral Portion	Grilled Tail Portion
Saturated fatty acids	45.53	45.93	46.14	46.13
Mono-unsaturated fatty acids	39.20	39.26	39.63	39.45
Poly-unsaturated fatty acids	7.72	7.76	7.95	7.74

5.3. Minerals Composition of Pangasius Fillets

Gokoglu et.al., 2004 reported the mineral composition of the raw and cooked meats of the fillets. It is established that the sodium content of the raw fillets is 501.5 mg/kg and for the microwave and fried fish, it is not significantly changed.

The different heat treatment methods such as microwave method, grilled and the steam cooked method are followed. The mineral composition of the grilled cooked fillets to be found less and after heat treatment there is an increase in the mineral composition such as the Na, P, Fe, Ca, Mg and Zn studied in the fish fillets. The sodium content of the grilled cooked head portion to be found in the range of 1654ppm and in tail portion of meat content, it is 1632ppm. The phosphorous content of the head portion of fillets is 4112ppm and in tail meat, it is 4132ppm. The iron content of the head portion of fillets is found to be in the range of 48ppm and in body meat, it is 44ppm. The zinc content of the head portion of fillets is found to be in range of 577ppm and in tail meat it is of 571ppm.

The calcium content of the head portion fillets to be found to be in the range of 2571ppm and in tail meat it is of 2675ppm. The magnesium content of the head portion is found to be in the range of 272ppm and in ventral portion it is of 276ppm. It can be explained that the minerals composition of both, it can be either increased or decreased after heat treatment. After heat treatment, the mineral composition in raw fillet is increased and in cooked fillet it is increased gradually.

Table 3: Minerals Composition of Pangasius Meat

Samples	Phosphorous (P) ppm	Iron (Fe) ppm	Zinc (Zn) ppm	Calcium (Ca)ppm	Magnesium (Mg) ppm	Sodium (Na) ppm
Microwave-H meat	4112	48	577	2571	272	1654
Microwave –B cooked meat	4131	44	576	2578	274	1667
Microwave –V cooked meat	4135	47	571	2572	276	1678
Microwave-T cooked meat	4137	42	573	2675	275	1632

4. CONCLUSIONS

The present research was carried out to study the nutritional composition of defattening of catfish (Pangassius *hyphoththalmus*) fillets. This study focused on the analysis of proximate, fatty acid and mineral composition from raw and grilled cooked fillets. Proximate composition gradually increased after heat treatment. Main composition was affected by moisture and fat content gradually decreased and ash and protein content increased after heat treatment. Fat composition of fillets was affected by heat treatment and it is mainly focused on the saturated and mono-unsaturated fatty acid composition and poly un-saturated fatty acid. After heat treatment, the defatted meat nutritional composition such as proximate composition moisture and fat content was gradually decreasing from the raw composition. Ash and protein content gradually increases after heat treatment. Saturated and mono-unsaturated fatty acid was affected by heat treatment this content gradually decreases from the raw composition and poly un-saturated fatty acid was increased after heat treatment. After heat treatment, SFA and MUFA content decreased and PUFA content was increased. Mineral composition gradually increased after heat treatment.

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